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Tursiops truncatus ssp. gephyreus, Lahille's Bottlenose Dolphin

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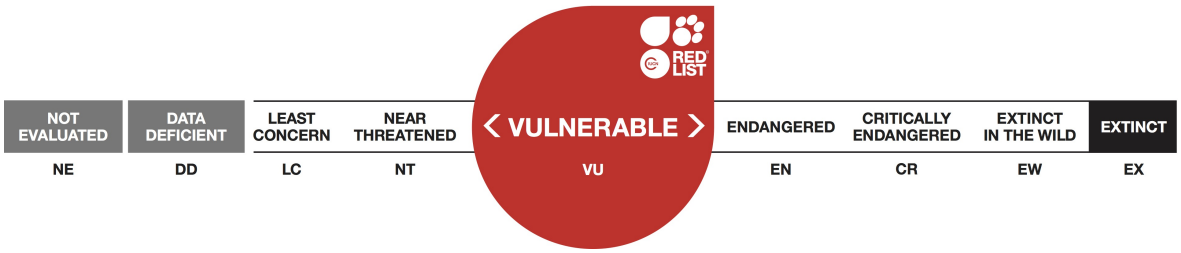

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Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Chordata	Mammalia	Cetartiodactyla	Delphinidae

Taxon Name: *Tursiops truncatus ssp. gephyreus* Lahille, 1908

Synonym(s):

- *Tursiops gephyreus* Lahille, 1908
- *Tursiops truncatus* Montagu 1821

Parent Species: See *Tursiops truncatus*

Common Name(s):

- English: Lahille's Bottlenose Dolphin, Bottlenosed Dolphin, Bottlenose Dolphin, Lahille's Bottlenose Dolphin, Lahille's Bottlenose Dolphin
- Spanish: Delfín Mular, Delfin nariz de botella, Tonina, Tonina Común, Tursion

Taxonomic Source(s):

Committee on Taxonomy. 2017. List of marine mammal species and subspecies. Available at: www.marinemammalscience.org. (Accessed: 31 August 2018).

Taxonomic Notes:

The taxonomy of Common Bottlenose Dolphins is confused mainly due to the geographical variability within the genus. Currently, two species – *T. aduncus* (Ehrenberg 1832) and *T. truncatus* (Montagu 1821) – and three subspecies are recognized for the genus by the Society for Marine Mammalogy's Committee on Taxonomy (2018). A recent re-assessment of the world-wide taxonomy of *Tursiops* conducted by the Scientific Committee of the International Whaling Commission confirmed the validity of three subspecies (IWC 2018), including Lahille's Bottlenose Dolphin (*T. t. gephyreus*) (Lahille 1908). Lahille's Bottlenose Dolphin is a large form found in the coastal waters of the western South Atlantic Ocean, and it is morphologically and genetically different from the offshore population (*T. t. truncatus*) in the region (Costa *et al.* 2015, 2016; Wickert *et al.* 2016; Fruet *et al.* 2017).

Assessment Information

Red List Category & Criteria: Vulnerable D1 ver 3.1

Year Published: 2019

Date Assessed: June 7, 2019

Justification:

Lahille's Bottlenose Dolphin, a subspecies of the Common Bottlenose Dolphin (*Tursiops truncatus*), occurs in low numbers only in southern Brazil, Uruguay and Argentina. Lahille's Bottlenose Dolphins are mainly resident to localized areas and restricted to coastal habitat resulting in a vulnerability to increasing pressures from human activities. Bycatch, pollution and prey depletion are the main known threats to the subspecies. There is evidence that the subspecies is declining in at least part of its range

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due to bycatch in fisheries and other unknown factors, although robust data on population dynamics is limited. Genetic variability of the subspecies is low at both nuclear and mtDNA markers. The abundance of Lahille's Bottlenose Dolphins has been estimated for most parts of the subspecies' range. The sum of available abundance estimates suggests a maximum total population size of 600 individuals. With an estimated 60% of mature individuals (Taylor *et al.* 2007), the total number of mature individuals in the subspecies can be estimated at 360, well below the threshold to be listed as Vulnerable under criterion D1.

Geographic Range

Range Description:

Lahille's Bottlenose Dolphins are distributed along the east coast of South America in the southwest Atlantic Ocean, between the state of Parana in southern Brazil in the North (approximately 25°S; Wickert *et al.* 2016) to the province of Chubut in Argentina in the South (approximately 46°S; Coscarella *et al.* 2012), a distributional range of approximately 3,500 km of coastline. Records of Bottlenose Dolphins exist further south and north of this range, but so far it remains uncertain if these sightings relate to Lahille's Bottlenose Dolphins or another subspecies of *T. truncatus* (e.g. Simões-Lopes and Fábian 1999, Bastida and Rodriguez 2003, Goodall 1989, Goodall *et al.* 2011, Vermeulen *et al.* 2017). The Argentina subpopulation (for justification of the subpopulations, see section "Population") ranges within Argentinean waters from the south of the province of Buenos Aires to the province of Chubut (Vermeulen *et al.* 2017). The southern Brazil-Uruguay subpopulation ranges between the state of Parana until the coast of Uruguay. The geographical gap between the two subpopulations relates to the Río de La Plata Estuary and the northern coast of the province of Buenos Aires (Vermeulen *et al.* 2017).

Country Occurrence:

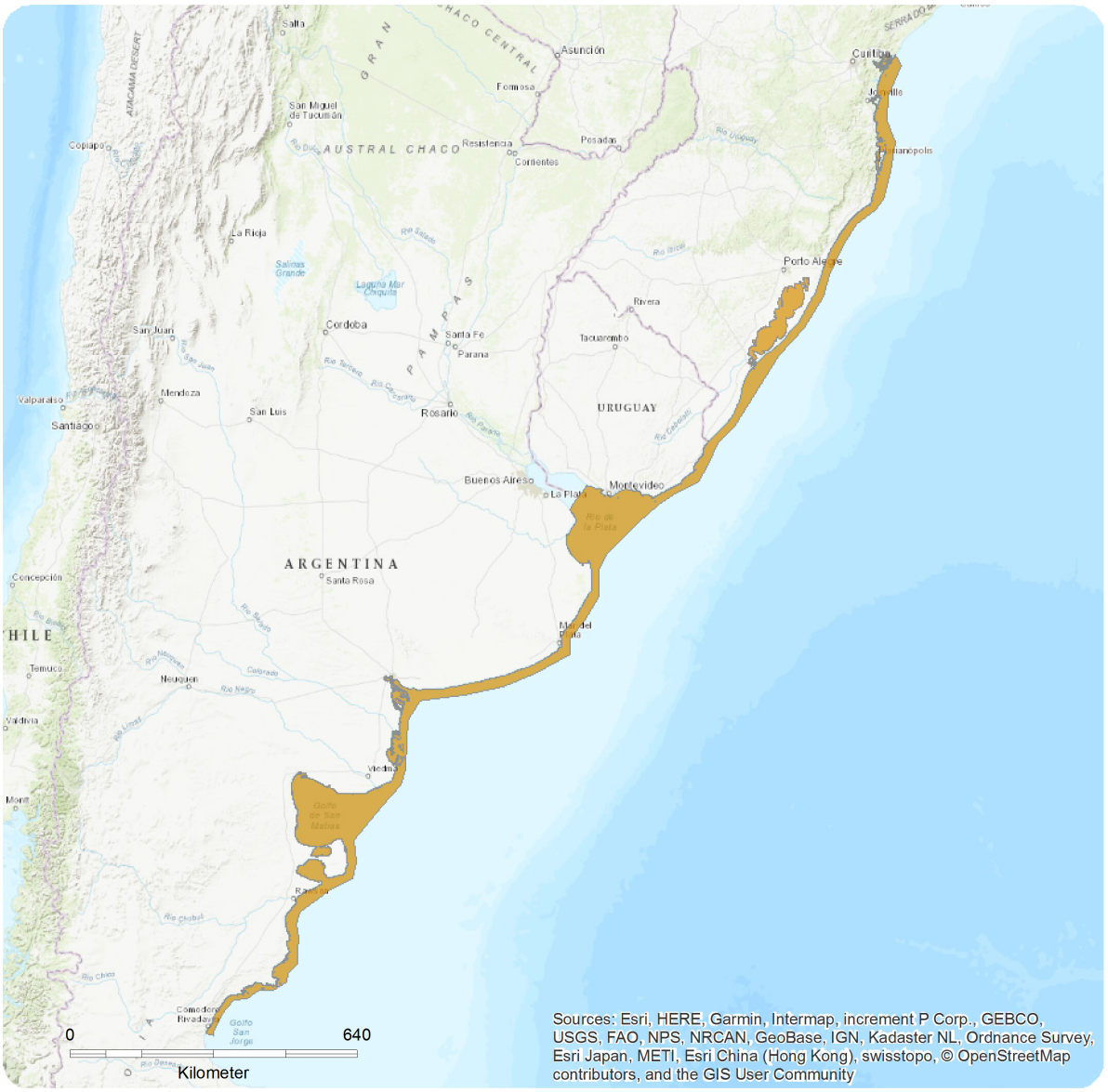
Native: Argentina; Brazil; Uruguay

FAO Marine Fishing Areas:

Native: Atlantic - southwest

Distribution Map

Tursiops truncatus ssp. gephyreus

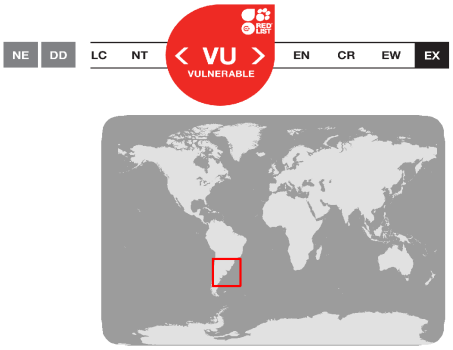


Range

Extant (resident)

Compiled by:

IUCN (International Union for Conservation of Nature)



The boundaries and names shown and the designations used on this map do not imply any official endorsement, acceptance or opinion by IUCN.

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Population

Lahille's Bottlenose Dolphins occur in two genetically and geographically isolated subpopulations: one located in the north of the range of the subspecies in southern Brazil and Uruguay, and a second in the south of the subspecies' range in Argentina (genetically sampled in Bahía San Antonio; Fruet *et al.* 2014). The combination of both genetic differences (Fruet *et al.* 2014) and a 700 km gap between the groups (Bastida and Rodriguez 2003; Vermeulen *et al.* 2017) makes them meet the IUCN definition of "subpopulation": geographically or otherwise distinct groups in the population between which there is little demographic or genetic exchange (typically one successful migrant individual gamete per year or less) (IUCN 2001, 2012). So far, it remains unknown if the observed genetic separation is caused by the adaptation to different biogeographic regions (see Fruet *et al.* 2014), or due to the relatively recent disappearance of the subspecies along the northern coast of the Buenos Aires province south to Río de La Plata estuary (area in between Uruguay and Patagonia), or their product.

The abundance of Lahille's Bottlenose Dolphins has been estimated for most parts of the subspecies' range. The sum of available abundance estimates suggests a maximum total population size of 600 individuals.

Argentina subpopulation

In Argentina, data from the 1970s in the northern province of Buenos Aires indicated an estimated abundance of approximately 100 resident Lahille's Bottlenose Dolphins (inferred from the number of uniquely identified individuals between San Clemente del Tuyu and Miramar; Bastida and Rodriguez 2003). Surveys conducted during the 1990s, failed to record any individuals in the same study area and it was concluded that these dolphins had completely disappeared in the past decade (Bastida and Rodriguez 2003, Vermeulen *et al.*2017). No other coastal areas were identified where the abundance has increased substantially over time, dismissing any hypothesis of a distribution shift (Vermeulen *et al.* 2017). Possible explanations for this disappearance relate to overfishing and other drastically increased anthropogenic pressures on the marine environment in that time period (e.g., pollution, habitat degradation, etc; Bastida and Rodriguez 2003), but no empirical data are available to sustain this hypothesis. Presently, Lahille's Bottlenose Dolphins only occur in the southern part of the province of Buenos Aires, in Bahía Blanca and Bahía San Blas. Although no precise abundance estimates are available in this region specifically, the numbers are believed to be low based on photo-identification data for the time period 2010-2016, not exceeding 50 individuals (Vermeulen *et al.* 2017). In the province of Río Negro, abundance was estimated at 83 (95% CI = 73 to 112) Lahille's Bottlenose Dolphins in Bahía San Antonio between 2009 and 2011 (using mark-recapture data and Pollock's Robust Design; Vermeulen and Bräger 2015), ranging at least along the entire coast of the San Matias Gulf (Failla *et al.* 2016, Coscarella *et al.* 2016, Vermeulen *et al.* 2017). Based on a viability analysis, numbers were estimated to be declining at a rate of 1.1% per year during the study period 2009 to 2011 due to a low recruitment rate related to a low number of reproducing females (Vermeulen and Bräger 2015). In the province of Chubut, 53 Bottlenose Dolphins were uniquely identified in the 1970s (Würsig and Würsig 1977). Aerial strip transect surveys conducted between 1999 and 2007 resulted in an abundance estimate of 34 Bottlenose Dolphins (CV=0.20) (Coscarella *et al.* 2012). Both numbers should be regarded as a maximum for the subspecies as the estimates include both *T. t. truncatus* and *T. t. gephyreus,* which occur in sympatry in the area.

These data combined indicate the existence of a very small and likely declining subpopulation of Lahille's

Bottlenose Dolphins in Argentina of at most 200 individuals, especially considering that photo-identification data showed movement of individuals between the province of Río Negro and Chubut and therefore some individuals might be represented in several datasets (Coscarella *et al.* 2016). **Southern Brazil-Uruguay subpopulation**

The southern Brazil-Uruguay subpopulation comprises at least five management units (MUs) characterized by moderate asymmetrical gene flow (Fruet *et al.* 2014). One MU is located in Uruguay and southern Brazil, whereas the other 4 are all located within Brazil. Two of these latter are strongly associated with estuaries (Patos Lagoon Estuary and Laguna) and two range freely along the shore break (Northern Patos Lagoon and Florianópolis) but have some degree of site fidelity in bays and river mouths, specifically the Itajaí River, North Bay, Mampituba River and Tramandaí River. Robust estimates of abundance using marking-recapture methods are available only for the estuarine MU, and are described below. *Southern Patos Lagoon-Uruguay Management Unit*

The southern Patos-Lagoon-Uruguay MU is located in Uruguay and southern Brazil, where Lahille's Bottlenose Dolphin abundance was estimated as 63 individuals (CI 95%: 54-74) in the area between La Coronilla beach and Cerro Verde e Islas de La Coronilla protected area (approximately 50 km^2) in 2008 (using open population models and mark-recapture data analyses; Laporta *et al.* 2016a). Some individuals ranged along the entire coast of Rocha Department and southern Brazil (Laporta 2009). Declines in numbers are inferred from a decrease in sighting frequency in the La Plata river estuary (Lázaro and Praderi 2000). *Patos Lagoon Estuary Management Unit*

The largest number of Lahille's Bottlenose Dolphins is found in the Patos Lagoon Estuary and adjacent coastal areas. Investigations into possible decline of these estuarine dolphins due to the high bycatch rates reported in this area between 2002-2006 (Fruet *et al.* 2012), found abundance to be relatively stable over the period 1998-2012, with an estimate ranging between 88 individuals (95% CI = 82-94) in 2011 to 78 individuals (95% CI = 70-86) in 2012 (Fruet *et al.* 2011, 2015). The highest abundance estimate found by a recent mark-recapture study covering the adjacent coastal areas of Patos Lagoon over the period 2014-2015 was 166 dolphins (95%CI: 152-182) in June 2015 using the POPAN model (Mendes 2017). However, it is important to note that the above abundance estimate likely accounts for part of the Southern Patos Lagoon-Uruguay MU as well, as dolphins from these two MU are commonly re-sighted in the sampled area (Laporta 2009; Mendes 2017). *Laguna Management Unit*

The second largest known MU of Lahille's Bottlenose Dolphin in Brazil is found in the estuary of Laguna, where a subset of the unit cooperates with artisanal fishermen. A series of abundance estimates of Lahille's Bottlenose Dolphins inhabiting the estuary of Laguna were generated using mark-recapture data collected between 2007 and 2009 (using Pollocks Robust Design Models). Abundance fluctuated over the years, between 59 in winter of 2008 (CI: 49-72) to 50 in the autumn of 2009 (CI: 40-62) (Daura-Jorge *et al.* 2013), with no evident trend (Daura-Jorge *et al.* 2013, Bezamat *et al.* 2018). Comparing contemporary and past mark-recapture abundance estimates in the area indicate a stable unit over the past decades (Simões-Lopes and Fabian 1999, Daura-Jorge *et al.* 2013). *Northern Patos Lagoon Management Unit*

In the Tramandai Estuary River mouth (29°58'S; 50°07'W) current (2010-2017) and past (1989-1991) photo-identification census data indicated 9-16 individuals have used the area for decades (Simões-Lopes and Fabian 1999, Giacomo and Ott 2016, Ilha *et al.* 2018). In the Mampituba River mouth and adjacent coast, about 20 Lahille's Bottlenose Dolphins were photo-identified during dedicated surveys carried out between 2012 and 2013 (Di Giacomo *et al.* 2017). There are some re-sightings of individuals between these two areas, which are genetically considered part of the same Management Unit (see Fruet *et al.* 2014). *Florianópolis Management Unit*

In North Bay, 39 individuals were photo-identified between 1994-2005 (Flores and Fontoura 2006) but

abundance was not estimated yet. Between August 2008 and April 2010, 10 Lahille's Bottlenose Dolphins were photo-identified in the Itajaí River mouth (100 kilometers further north) and abundance was estimated at 11 individuals (95%CI: 10-17) based on mark-recapture data (Demessiano and Barreto 2010). However, it is important to note that these two areas share a significant proportion of individuals. Abundance of Lahille's Bottlenose Dolphins has not been estimated in some open coastal areas outside these long-term studied regions, but density in those locations is believed to be very low.

Current Population Trend: Decreasing

Habitat and Ecology (see Appendix for additional information)

Lahille's Bottlenose Dolphins occur primarily in very shallow coastal waters (e.g., Vermeulen 2017), including estuaries, bays and lagoons, occasionally ranging far up into rivers (e.g. Simões-Lopes 1991, Bastida and Rodriguez 2003, Failla *et al.* 2016). When in the open coast, sightings occur mainly along the shore break, within 3 km from the coast (Di Tullio *et al.* 2015; Lodi *et al.* 2017). Sighting data suggest no movement out into waters greater than 30 m in depth (Vermeulen *et al.* 2017), although along shore movements of individuals frequently occurs (Simões-Lopes and Fábian 1999, Laporta 2009, Laporta *et al.* 2016b, Coscarella *et al.* 2016). Lahille's Bottlenose Dolphin is parapatric with Common Bottlenose Dolphins (*T. t. truncatus*) in Brazil and Uruguay, but there are sympatric records in the province of Río Negro and Chubut, in Argentina (Vermeulen *et al.* 2017). In most of their range, Lahille's Bottlenose Dolphins maintain definable, long-term, multi-generational home ranges (Daura-Jorge *et al.* 2013, Fruet *et al.* 2015, Giacomo and Ott 2016, Laporta *et al.* 2016b, Vermeulen *et al.* 2016). Lahille's Bottlenose Dolphins have a marked reproduction season, with most births occurring in pulse between late spring and summer (see Fruet *et al.* 2016 for a review). They have great behavioural plasticity, with inter- and intra-population variations in behaviour. They are known for cooperative fishing with artisanal fishermen in some localities in southern Brazil (Simões-Lopes *et al.* 1998, Ilha *et al.* 2018). Lahille's Bottlenose Dolphins live in complex societies, usually in small groups that tend to associate by chance for a short time or to perform specific behaviours despite their long-term multi-generational home-ranges and small population sizes (e.g. Daura-Jorge *et al.* 2012, Vermeulen 2018). The mean group size ranges from three to six individuals, depending on the locality (see Domit *et al.* 2016 for review), with a maximum group size of around 50 animals recorded in Bahía San Antonio, Argentina (Vermeulen *et al.* 2015). Lahille's Bottlenose Dolphin consumes a wide variety of fish and cephalopod species. Within Argentina this includes e.g., the pouched lamprey (*Geotria australis*) and the Southwest Atlantic butterfish (*Stromateus brasiliensis*) (Coscarella and Crespo 2009, Romero *et al.* 2014). In Brazil, Lahille's Bottlenose Dolphins have been documented to feed primarily on teleost fish, about 20 prey species were identified including demersal fish such as Atlantic white-croaker (*Micropogonias furnieri*), southern king croaker (*Menticirrhus spp*.), mullet (*Mugil liza*), banded-croaker (*Paralonchurus brasiliensis*) and demersal-pelagic species such as swordfish (*Trichiurus lepturus*) (Pinedo 1982, Secchi *et al.* 2016, Milmann *et al.* 2016). Other prey types such as coastal squids (family *Loliginidae*), octopus (*O. vulgaris*), crustaceans (order *Anomura*) and shrimps were also recorded but in very low frequencies (see Laporta *et al.* 2016c for review). In Bahía Samborombón, as well as in northern Patagonia, Argentina, there are several records of Lahille's Bottlenose Dolphins being preyed upon by Killer Whales (*Orcinus orca*) (Lichter 1992; Vermeulen unpublished data).

Systems: Marine

Threats (see Appendix for additional information)

Due to their low numbers, high site fidelity and restricted coastal distribution, Lahille's Bottlenose Dolphins are particularly sensitive to local anthropogenic impacts. Of particular conservation concern is the Argentina subpopulation, due to its small size, apparent genetic isolation from the rest of the subspecies and its low genetic variability (data so far rendered a single and unique mtDNA haplotype).

Argentina subpopulation

Within Argentina, Marcovecchio *et al.* (1990, 1994) and Moreno *et al.* (1984) indicated highly elevated levels of heavy metals in Bottlenose Dolphins in several regions along the coast. Vermeulen and Bräger (2015) indicated this as a possible cause for the apparent decline associated to a low recruitment rate (due to low number of reproducing females) in their study area in Bahía San Antonio. It was suggested that adult mortality may not be the most direct and eminent threat to Lahille's Bottlenose Dolphins in the country and that the observed declines are more likely related to decreased reproductive success (Vermeulen and Bräger 2015, see also Vermeulen *et al.* 2017). However, more long-term data are needed to confirm this hypothesis. Overall, within this subpopulation there are a few records of incidental capture in fishing gear or of mortality due to collisions with boats (Crespo *et al.* 1994, 1997, 2008), and no elevated levels of adult mortality were detected in the last 30 years (Coscarella *et al.* 2012; Vermeulen *et al.* 2017). Another likely threat to this subpopulation includes reduced prey availability caused by environmental degradation and overfishing (especially in the province of Buenos Aires and Chubut) (Bastida and Rodriguez 2003, Coscarella *et al.* 2012). However, data are still lacking to backup these hypotheses.

Southern Brazil-Uruguay subpopulation

Similar to the situation in Argentina, adult mortality does not appear to be the basis of the inferred decline in the number of Lahille's Bottlenose Dolphins in Uruguay (P. Laporta pers. obs.). Although very little information exists on possible direct and indirect threats to the subspecies in Uruguayan waters, contamination from agricultural effluents could be a source of concern due to the pollutant load detected in other marine organisms at the discharge of Canal Andreoni (Lercari and Defeo 1999, Sauco *et al.* 2010), an area of high occurrence of Lahille's Bottlenose Dolphins. Reduced prey availability caused by overfishing and destruction of benthic ecosystems due to these fisheries are other possible threats for the subspecies in Uruguay. As in Argentina, the incidental capture of Lahille's Bottlenose Dolphins in fishing gear is rare, with only a few studies reporting bycatch of 9 individuals in total, despite systematic studies (Pilleri and Gihr 1972; Praderi 1985, 2000; Domingo *et al.* 2006; Laporta *et al.* 2006; Franco-Trecu *et al.* 2009; Passadore *et al.* 2015). It was concluded that this is likely a result of the differential spatial use between Lahille's Bottlenose Dolphins and the fisheries (Fruet *et al.* 2016). On the other hand, within Brazil, incidental mortality in fishing gear, especially coastal gillnet and beach-seine, is the major current threat to Lahille's Bottlenose Dolphins (see Fruet *et al.* 2016 for review). By-catch rates in the Patos Lagoon Estuary are reportedly the highest throughout the distribution of the subspecies (Fruet *et al.* 2014, Fruet *et al.* 2016). As such, the carcasses of 21 individuals found in coastal beaches near Patos Lagoon Estuary between 2002 and 2006 presented clear evidences of fishery interaction, representing 46% of the overall Lahille's Bottlenose Dolphin mortality in the area. Evidence of interactions with fisheries included amputation or deep knife cuts on caudal peduncle, net marks on flippers and rostrum and carcass entangled in nets. The number of dolphins incidentally caught per year ranged from two to nine (average = 3.4; SD=1.6). This number exceeded the potential biological removal (ranging between 0.128 and 1.6 individuals/year) of the Patos Lagoon Estuary MU and may lead to a decline if they remain constant (Fruet *et al.* 2012). Plausible arguments to explain the apparent stability of this MU based on abundance estimates over various decades, are that bycatch is strongly skewed towards immature males, retarding its effects on population dynamics. Additionally, bycatch may affect coastal dolphins not computed in the abundance estimate, as dolphins from three MU overlap in their home ranges in this area. Therefore, the apparent stability of the Patos Lagoon Estuary MU should be

viewed with caution. For the other MUs in Brazil, mortality levels appear to be lower than for Patos Lagoon Estuary (e.g. 27% of observed Lahille's Bottlenose Dolphin mortality in the state of Santa Catarina, Simões-Lopes and Ximenez 1993). However, recent records suggest an increase resulting in a similar bycatch level (e.g. 50% of observed mortality in the Laguna MU; Bezamat *et al.* 2018). Although still incipient, results from recent studies in southern Brazil indicate that individual levels of PCBs in Bottlenose Dolphins from Patos Lagoon Estuary MU and Laguna MU frequently exceed thresholds for risk of reproductive impairment and for the onset of physiological effects, established for the species (Righetti 2018). There are also increasing records of skin lesions in *T. t. gephyreus*, which may be derived from water contamination (e.g., Van Bressem *et al.* 2007, Reif *et al.* 2009). The first case of "lobomicosis-like disease" (= lacaziosis; LLD) in southern Brazil was recorded in early 1990s for a dolphin from the Laguna MU (Simões-Lopes *et al.* 1993). More recent data indicate an increase prevalence of LLD in the Laguna MU as well as in Lahille's Bottlenose Dolphins of other coastal MU of southern Brazil (Moreno *et al*. 2008). Specifically in the Laguna MU, LLD was recorded in 5.6% of the individuals between 2006-2009, increasing to 13.9% in 2013-2014 (Van Bressem *et al.* 2015). In studies using histopathological and immune-histochemical approaches, the pathogenic agent *Paracoccidioides brasiliensis* (Sacristán *et al.* 2016) was determined. The possible implications of these skin diseases are not yet known. Port (especially dredging) and industrial activities in estuarine environments, where these dolphins are usually found, are considered another threat in Brazil. In addition, depletion of fish stocks may be an added threat, as suggested from a shift in the subspecies' diet in the Patos Lagoon Estuary and adjacent coastal areas from the Atlantic whitecroaker (*Micropogonias furnieri*) and southern king croaker (*Menticirrhus sp.*) to the Atlantic cutlassfish (*Trichiurus lepturus*) (Secchi *et al.* 2016).

Conservation Actions **(see Appendix for additional information)**

The common bottlenose dolphin (*Tursiops truncatus*) is listed in Appendix II of CITES, and Appendix II of the Convention on Migratory Species (CMS). The subspecies *T. t. gephyreus* is protected under the following laws:

Argentina

• National law Nº 22.241 for the conservation of wild species

• Law Nº 25.577, forbidding the killing of cetaceans in national waters

• United Nations Convention on the Law of the Sea (UNCLOS), approved by National Law Nº 24.543/1995

• CITES, approved by National Law Nº 22.344

• Convention on Biological Diversity, approved by National Law Nº 24.375

• Provincial Law N° 4115 (Río Negro); full protection of marine mammals in provincial waters

• Provincial Law XI- 4 (ex 2381) (Chubut); full protection of marine mammals in provincial waters

Uruguay

• Decree 13/993.- Ministry of Livestock, Agriculture and Fisheries conservation and preservation of marine mammals

• Decree 238/998. Ministry of Livestock, Agriculture and Fisheries. Forbidding the killing and for the protection of marine mammals.

• Law N° 16.320. Ministry of Economy and Finances. Conservation and preservation of marine mammals.

• Included in the List of Conservation priority species of the National System of Protected Areas. National Direction of Environment-Ministry of Housing, territorial planning and environment.

Brazil

• Federal Law (Law 7,643, dated 12/18/87)
• In Laguna, Santa Catarina, Municipal Law No. 521 of November 10, 1997, declares the Lahille's Bottlenose Dolphin as Natural Heritage of the Municipality.
• Municipal Decree N° 3922 \ 2013 prohibits the recreational use of jet sky in the main concentration areas of the Laguna MU and regulates the speed and space for jet sky displacement.
• Municipal Law N° 1.998 of June 18, 2018, prohibits the use of gillnets in the core areas for the Lahille's Bottlenose Dolphin MU in Laguna.
• In the state of Rio Grande do Sul, increasing threats led the subspecies to be listed as "Vulnerable" in its list of Endangered Fauna species (State Decree 51,797 of September 8, 2014).
• In 2012, a protection area was established in the Patos Lagoon Estuary and adjacent marine system, prohibiting boat-based gillnet fisheries in order to reduce incidental catch (Article 8 of the Inter-ministerial Regulation 12/2012 - Brazil 2012). The area covers a line parallel to the coast, with an extension of 30 km (15 km to the north and 15 km to the south of the mouth of the estuary), with a width of two kilometers (from the coast). It also covers two kilometers around the jetties and five kilometers of the estuarine area closest to the mouth of the estuary, which correspond to the areas of higher densities of fishing nets and *T. t. gephyreus* (Di Tullio *et al.* 2015).

Credits

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Reviewer(s): Braulik, G., Reeves, R. & Taylor, B.L.

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External Resources

For Images and External Links to Additional Information, please see the Red List website.

Appendix

Habitats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Habitat	Season	Suitability	Major Importance?
5. Wetlands (inland) -> 5.1. Wetlands (inland) - Permanent Rivers/Streams/Creeks (includes waterfalls)	-	Marginal	-
9. Marine Neritic -> 9.10. Marine Neritic - Estuaries	Resident	Suitable	Yes
10. Marine Oceanic -> 10.1. Marine Oceanic - Epipelagic (0-200m)	Resident	Suitable	Yes
13. Marine Coastal/Supratidal -> 13.4. Marine Coastal/Supratidal - Coastal Brackish/Saline Lagoons/Marine Lakes	Resident	Suitable	No

Threats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Threat	Timing	Scope	Severity	Impact Score
1. Residential & commercial development -> 1.1. Housing & urban areas	Ongoing	Whole (>90%)	Negligible declines	Medium impact: 6
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation		
1. Residential & commercial development -> 1.2. Commercial & industrial areas	Ongoing	Whole (>90%)	Negligible declines	Medium impact: 6
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation		
1. Residential & commercial development -> 1.3. Tourism & recreation areas	Ongoing	Majority (50-90%)	Negligible declines	Low impact: 5
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation		
4. Transportation & service corridors -> 4.3. Shipping lanes	Ongoing	Majority (50-90%)	Negligible declines	Low impact: 5
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation		
5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.3. Unintentional effects: (subsistence/small scale) [harvest]	Ongoing	Whole (>90%)	Slow, significant declines	Medium impact: 7
	Stresses:	2. Species Stresses -> 2.1. Species mortality		
6. Human intrusions & disturbance -> 6.1. Recreational activities	Ongoing	Minority (50%)	Negligible declines	Low impact: 4
	Stresses:	2. Species Stresses -> 2.2. Species disturbance		
7. Natural system modifications -> 7.2. Dams & water management/use -> 7.2.11. Dams (size unknown)	Ongoing	Minority (50%)	Negligible declines	Low impact: 4
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation		

9. Pollution -> 9.1. Domestic & urban waste water -> 9.1.1. Sewage	Ongoing	Majority (50-90%)	Slow, significant declines	Medium impact: 6
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation		
9. Pollution -> 9.1. Domestic & urban waste water -> 9.1.2. Run-off	Ongoing	Whole (>90%)	Slow, significant declines	Medium impact: 7
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation		
9. Pollution -> 9.1. Domestic & urban waste water -> 9.1.3. Type Unknown/Unrecorded	Ongoing	Whole (>90%)	Slow, significant declines	Medium impact: 7
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation		
9. Pollution -> 9.2. Industrial & military effluents -> 9.2.2. Seepage from mining	Ongoing	Minority (50%)	Slow, significant declines	Low impact: 5
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation		
9. Pollution -> 9.2. Industrial & military effluents -> 9.2.3. Type Unknown/Unrecorded	Ongoing	Whole (>90%)	Slow, significant declines	Medium impact: 7
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation		
9. Pollution -> 9.3. Agricultural & forestry effluents -> 9.3.4. Type Unknown/Unrecorded	Ongoing	Whole (>90%)	Slow, significant declines	Medium impact: 7
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation		
9. Pollution -> 9.4. Garbage & solid waste	Ongoing	Majority (50-90%)	Negligible declines	Low impact: 5
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation		

Conservation Actions in Place

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Actions in Place
In-Place Land/Water Protection and Management
Conservation sites identified: Yes, over entire range
In-Place Education
Included in international legislation: Yes
Subject to any international management/trade controls: Yes

Conservation Actions Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Actions Needed
1. Land/water protection -> 1.1. Site/area protection
1. Land/water protection -> 1.2. Resource & habitat protection
3. Species management -> 3.2. Species recovery
4. Education & awareness -> 4.3. Awareness & communications
5. Law & policy -> 5.4. Compliance and enforcement -> 5.4.3. Sub-national level

Research Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Research Needed
1. Research -> 1.1. Taxonomy
1. Research -> 1.2. Population size, distribution & trends
1. Research -> 1.3. Life history & ecology
1. Research -> 1.5. Threats
1. Research -> 1.6. Actions
2. Conservation Planning -> 2.2. Area-based Management Plan
3. Monitoring -> 3.1. Population trends
3. Monitoring -> 3.2. Harvest level trends
3. Monitoring -> 3.4. Habitat trends

Additional Data Fields

Population
Number of mature individuals: 360
Population severely fragmented: No
Habitats and Ecology
Continuing decline in area, extent and/or quality of habitat: Unknown
Movement patterns: Not a Migrant

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